Review of " DRAFT Agricultural Economic Effects of Lower San Joaquin River Flow Alternatives.

June 11, 2011

General comments and observations:

Over the past several decades, the state of California, through investments in its various natural resource agencies, combined with its excellent public university system, has developed an impressive level of data, modeling capabilities and human capital in the area of water resources, broadly defined. Such investments have no doubt been motivated by the challenging water resource issues which the state has, and continues, to face. The analyses performed here integrate well documented, off-the-shelf water resource-oriented models developed within state agencies or the university system, e.g.; WSE, CALVIN and SWAP, to explore the effects of the LSJR flow alternatives on crop production and revenues in the area served by the three tributaries. These estimates of changes in crop production and revenues is then used as input in a well documented regional economic model (IMPLAN) to measure impacts on the broader economy of the LSJR basin. In my opinion, the authors have implemented this integration effort in a technically competent fashion.

The report contains a brief discussion of the features of each model and key assumptions used in the effort. The results of the integration exercise are summarized in this report primarily through reliance on a series of tables, charts and other graphics. The heavy use of tables etc may have been required to meet page limits, and in general, the key findings of the analyses are obvious. However, I found some of the charts, such as the series of charts on changes in annual crop production, by crop, to be of relatively low value in term of understanding the consequences of the proposed stream flows. Fewer charts of this type and more textual discussion would, in my opinion, make the report more interesting and transparent. More generally, presenting results from an integrated modeling exercise of the type used here is a challenging task, in part because the models typically are capable of generating a wide range of outputs, often across various spatial and temporal scales, and with an aura of precision that may be misleading. The key challenge is that the output from these modeling exercises be presented to decision makers and stakeholders with adequate caveats and that the resultant numerical estimates be placed in context with other types of information available to decision makers.

My review comments follow the charge to reviewers as defined in Attachment 2 in the packet of material provided to reviewers by the Water Board. I note that the requested review is somewhat circumscribed compared with a peer review for publication in a scientific journal. In particular, the reviewers are asked to comments primarily on issues related to the technical competency of the underlying models and framework, and on the "validity" of the findings and conclusions.

Responses to specific questions posed to reviewers (from Attachment 2):

1) "Use of the Statewide Agricultural Production (SWAP) model was based on sound economic knowledge, methods, and practices."

In my opinion, yes. The SWAP model is one of three models which make up the modeling framework used here (the other two are the WSE model and the IMPLAN model). As the authors' of this report make clear, SWAP has a history of use in measuring changes in agricultural output and revenue for California under alternative water scenarios. Results of SWAP have been published in both the "grey" literature, such a state agency reports or consulting reports, and the peer-reviewed literature. The underlying optimization procedure in SWAP (Positive Mathematical Programming or PMP) has been subject to rigorous peer review and has been widely applied. In my opinion, it a useful technique within the general tool kit of optimization models. Its use in this analysis follows general protocols of calibration (validation) using appropriate economic and physical data.

2) "Use of the IMPLAN model was based on sound economic knowledge and methods."

In my opinion, yes. As noted above, output from SWAP is used as input into the general family of regional (county-level) economic models known as IMPLAN. IMPLAN models and their data are updated periodically by the purveyors of this family of models and I assume that the data used for the LSJR basin counties reflect the latest version of such data. Changes in agricultural production and revenues associated with changes in water diversions under the LSJR are estimated by SWAP and then used in IMPLAN to capture changes in a range of economic metrics such as employment, or overall regional economic activity for the agricultural sector. The application of IMPLAN in this assessment follows the generally accepted standards and procedures of regional economic analysis.

3) This question relates to the nature of an assumption used in the analysis regarding the availability of other water sources (e.g.; ground water, or off stream water storage) to mitigate for loss of surface diversions under the flow alternatives. The assumption made by the authors' (of no such additional water resources) is a conservative one, in my opinion. Years of empirical research have documented that irrigators will seek other water sources when confronted with water supply disruptions. By not allowing such an adjustment in the modeling of the stream flow effects, the assessment here likely overstates the economic costs of the flow alternatives.

4) "Reasonableness of other assumptions"
As with any modeling exercise, simplifying assumptions are frequently made to keep the problem tractable. Several assumptions relate to time period or baseline conditions. For example, the report states that the baseline against which to judge the flow alternatives is 2009. While I have no reason to question the use of this year, it was not clear why the authors chose this base year. Typically, choice of a base year is justified by appealing to its "reasonableness" relative to the choice of a different year. Or more commonly, the average of a short time series of years may be used to smooth out annual variability. However, unless 2009 was very atypical water year, its use should not create a problem in terms of the general magnitude and direction of the economic costs associated with the flow alterations. Changes from this base line are based on 82 years of water data, which seems appropriate. Other simplifying assumptions, such

as aggregating the three watershed diversions into one measure due to the broader geographical definitions (lower spatial resolution) within the SWAP model, in my opinion, is not a problem in terms of the usefulness of the results. I mention this because typically aggregate economic estimates are deemed appropriate for societal decisions involving the efficacy of the alternative flows or of regulations more generally, at least at the Federal level (.e.g.; "Principles and Standards" regarding economic analyses of water resource issues). If there are specific distributional or geographic sensitivities or questions associated with economic costs of the decision, then disaggregation would be required.

5) "The analysis covers a reasonable range of economic factors and consideration".
As is noted in the supplemental material provided to the reviewers, this is not a benefit-cost analysis and none is required under California state law. It is not clear whether California has a standard definition of "reasonable range" but in my opinion, the range of economic factors and behaviors captured in the SWAP model and the regional impacts embedded in the IMPLAN model qualify as a reasonable basis on which to measure economic consequences of the alternative water diversion levels.

6) "The results of the analysis are valid."
As noted earlier, the analyses performed here use accepted models and procedures to measure the economic effects of the alternative water diversion (reductions) arising from the flow alternatives. The key assumptions are reasonable and the findings or conclusions follow naturally for economic intuition and expectations; e.g. higher spring flow requirements for environmental purposes lowers surface water diversions to agriculture, which in turn leads to costs to irrigators in the form of lost revenues and to rural communities in terms of foregone , employment, business activity, etc. in the study area.. Given these characteristics of the analysis, I judge the key findings and conclusions to be valid, although that is different than saying the any particular numerical estimate is "accurate". In my opinion, the value of such integrated modeling assessments as performed here is in providing policy makers and stakeholders with information with which to make comparative judgments regarding states of the world captured in the flow alternatives, not in predicting a precise numerical estimate of a single effect.

7) "Other issues."
This analysis focuses on the impacts to agriculture within the LSJR area. The report and accompanying material indicate that the benefits of increased stream flows in terms of environmental benefits are to be measured in a different report/document. It is not clear where (and whether) the benefits to south Delta agriculture of reduced salinity will be captured in some future report. I believe that this current analysis could have easily been extended to add such a component. Similar extensions could also be envisioned. Perhaps the mix of regulatory rules and procedures and legislation in California surrounding water rights, water supplies, water quality and so forth renders larger scale and more comprehensive evaluations unnecessary?